

**A COMPACT ELECTRICALLY AND OPTICALLY PUMPED MULTI-  
WAVELENGTH NANOCAVITY LASER, MODULATOR AND DETECTOR  
ARRAYS AND METHOD OF MAKING THE SAME**

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**Abstract of the Disclosure**

A compact, electrically and optically pumped multi-wavelength nanocavity  
laser, modulator and detector array uses lithography to define the precise  
10 spectral response of each element. High fields are applied within optical  
nanocavities to take advantage of photonic crystals filled with nonlinear  
materials. These nonlinearities and high fields are used to define tunable  
nanocavity lasers, detectors, routers, gates and spectrometers for wavelength  
and time division multiplexing applications. Similarly, nanofabricated optical  
15 waveguides can be used for efficient coupling of light between devices. The  
lithographic control over the wavelength and polarization supported within  
photonic crystal cavities is used to construct compact nanophotonic laser and  
detector arrays, and all-optical gates and routers. The photonic crystal couples  
light emitted by one cavity, and uses it to optically pump another with negligible  
20 diffraction losses. The emission wavelength of light from these photonic crystal  
lasers can be varied by simple adjustments of the lithographic pattern during their  
fabrication.

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